

What is claimed is:

1. A process comprising the steps of
mixing particles of a metal powder with a lubricant having a characteristic of
becoming liquid under pressure and of evaporating under a sintering temperature and at
least one liquid phase former to form a mixture;
compressing the mixture at a pressure sufficient to liquefy and uniformly
distribute the lubricant within the compressed mixture with said lubricant effecting a
uniform distribution of said liquid phase former on said particles of metal powder; and
sintering the compressed mixture at a sintering temperature sufficient to
evaporate and drive off said lubricant and to effect a liquid phase sintering of said liquid
phase former with said particles of metal powder to obtain a compressed and sintered
product having a density of 99+% of theoretical density.
2. A process as set forth in claim 1 wherein said metal powder is a ferrous metal
powder.
3. A process as set forth in claim 1 wherein said lubricant is one of APEX PS1000b,
lauric acid and Johnson's Floor Wax.
4. A process as set forth in claim 1 wherein said liquid phase former is at least one
of synthetic graphite, nickel, boron, phosphorous and compounds of boron and
phosphorous.
5. A process as set forth in claim 1 wherein said mixture is compressed under a
compaction pressure of 35 to 70 tons per square inch.
6. A process as set forth in claim 1 wherein said mixture is compressed through
high velocity compaction.

7. A process as set forth in claim 1 wherein said mixture is compressed under a compaction pressure greater than 45 tons per square inch.
8. A process as set forth in claim 1 wherein said compressed mixture is sintered at a temperature in the range of from 2070 to 2500° with the preferred range being 2300 to 2500 F.
9. A process as set forth in claim 1 wherein said compressed mixture is sintered at a temperature in the range of from 2300 to 2500° for a time of from 10 to 60 minutes.
10. A process as set forth in claim 1 wherein said step of compressing includes placement of the mixture in a tool whereby during compressing of the mixture into a green compact the liquefied lubricant forms a liquid film between the tool and the mixture to cause a green compact with a uniform density gradient to be obtained.
11. A product made in accordance with the process of claim 1.
12. A powder metal product having a density of 99+% of theoretical.
13. A powder metal product as set forth in claim 12 having a uniform density gradient throughout the product.
14. A powder metal product as set forth in claim 12 characterized in being formed of at least one of iron and low alloy steel finer than 100 mesh and a liquid phase former having a characteristic of forming a liquid phase during sintering and of becoming part of the final product after sintering.
15. A powder metal product as set forth in claim 14 characterized in that said liquid phase former is one of nickel, phosphorous, boron, a compound of boron and a compound of phosphorous and is finer than 20 microns.

16. A powder metal product as set forth in claim 14 characterized in that said liquid phase former is one of nickel, phosphorous, boron, a compound of boron and a compound of phosphorous and is finer than 10 microns.

17. A powder metal product as set forth in claim 14 characterized in that said liquid phase former is synthetic graphite and is finer than 10 microns.

18. A powder metal product as set forth in claim 14 characterized in that said liquid phase former is synthetic graphite and is finer than 2 microns.